

STUDY FOR
CONTROL DATA CORPORATION

ZCDA 7/88

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STUDY FOR CONTROL DATA CORPORATION

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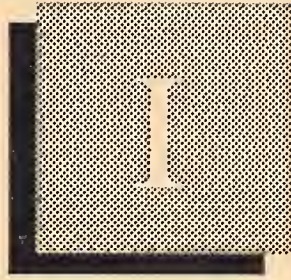
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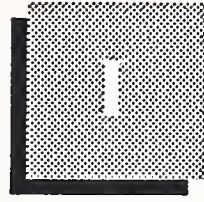


Introduction



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Introduction

This chapter contains a discussion of the objectives of the study performed for Control Data Corporation (CDC). In addition, this chapter describes the methodology that was used in this custom work to obtain the conclusions and subject matter reported herein.

A

Objectives

The primary focus of this custom work was to identify “. . . the best industry market segments and applications in the systems integration market that meet the. . . objectives of CDC.” The original primary focus was to look at possible acquisition objectives. This focus was modified to be an evaluation of systems integration (commercial) markets at a meeting held at CDC World Headquarters on May 5, 1988 with no preconceived notion of acquisition.

For each industry segment the custom work/study provides several applications that are, or could be, applicable to a commercial systems integration-type activity by Control Data.

In addition, INPUT selected four market segments that seem particularly attractive to CDC based on a screen developed of CDC’s skill set for commercial systems integration.

The applications are presented for all the major industry segments monitored by INPUT as shown in Exhibit I-1 below.

EXHIBIT I-1

MAJOR INDUSTRY SEGMENTS

Manufacturing (Process and Discrete)	Insurance
Banking and Finance	Medical
Distribution (Retail and Wholesale)	Education
State and Local Government	Services
Transportation	Utilities
Telecommunications	Federal*

* Note: Federal not included in Commercial Systems Integration

B**Scope**

The scope of the report has been defined as described below:

1. The identification of four key industry or cross-industry market segments in commercial systems integration that have the best "fit" for CDC.
2. The identification of significant applications in each of the industry segments. This report does not purport to contain an exhaustive list of CSI applications.
3. The inclusion of an industry market forecast for each of the segments for the years 1987 through 1992, including growth rates.
4. The project focus is primarily on the U.S. market.

C**Methodology**

The study is based on the use of secondary source material (e.g., INPUT files, trade publications, etc.) to develop a list of the key CSI applications.

An ongoing dialogue with other INPUT individuals involved in performing primary research in systems integration was also used.

Based on the above, each application was categorized by the industry-specific market segment that is most appropriate for that application.

A screen or template of Control Data's skillset to perform as a commercial systems integrator was developed by scrutiny of the most recent annual reports and through an on-site meeting to discuss CDC's professional services capabilities.

Using this CDC template and skillset and comparing it with applications in each segment yielded a best "fit" scenario. Included in this scenario was a sense of the "emerging" CSI application systems. Emerging systems are those that will have a major market impact within the next five years. This emerging systems list was developed by using existing INPUT data.

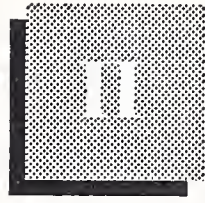
The application "examples" provided for each industry segment have been selected from previous research projects performed by INPUT. In each case only the identification of the appropriate project is listed.

It is noted that there was no primary research performed exclusively as part of this project. In other words, there was no questionnaire developed and used to call other vendors or users to determine their view of the CDC capabilities in CSI.



Executive Overview





Executive Overview

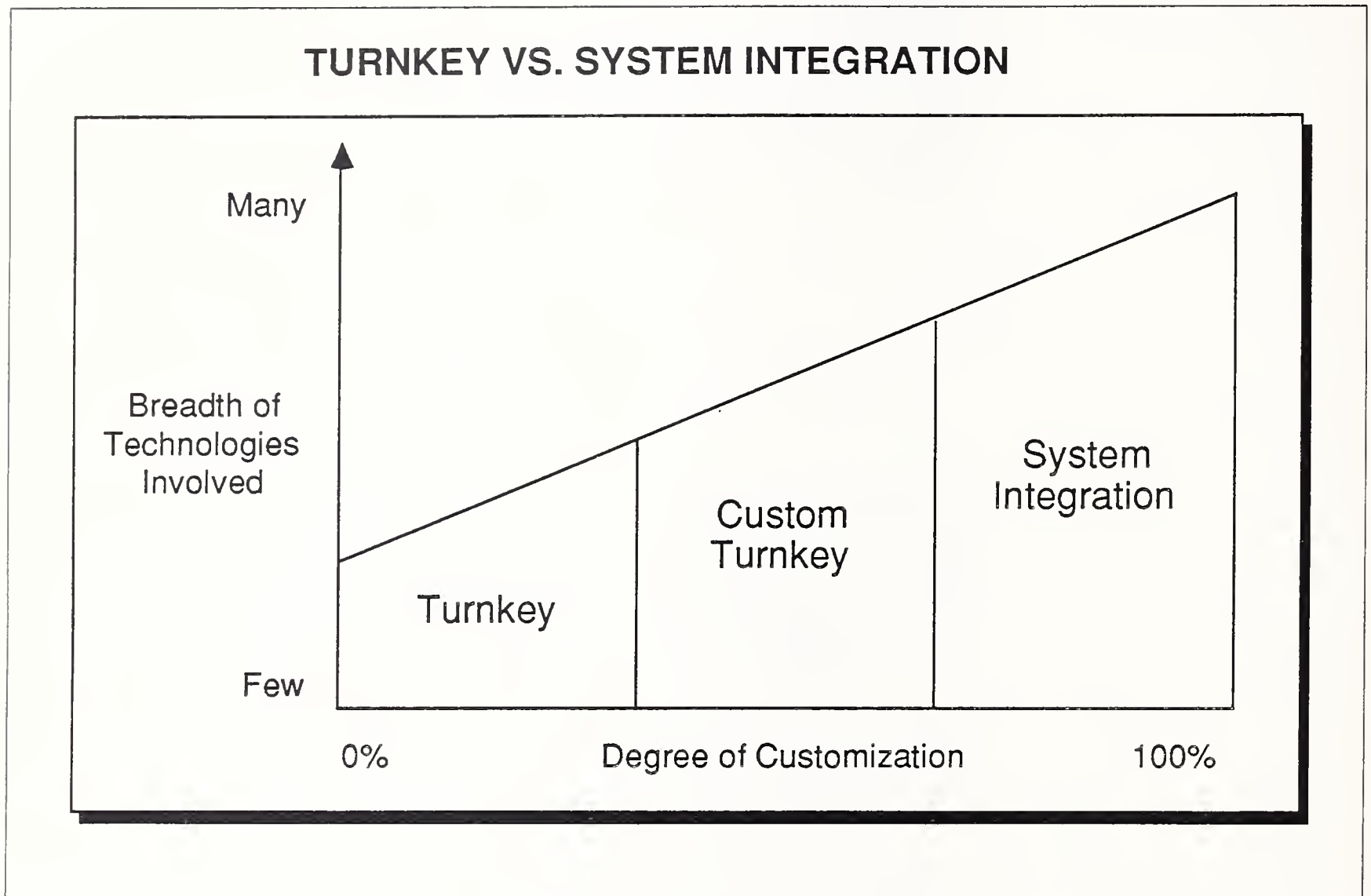
The purpose of this chapter is to provide a brief overview of the Computer Services industry, with specific focus on the Commercial Systems Integration market. In each of the subsequent industry application descriptions there are comments describing the “driving forces” for information systems and services in that particular industry segment.

This chapter contains a summary of the driving forces for each of the key industry segments, together with an outline of the key future applications by segment. These have a direct bearing on CSI opportunities.

Furthermore, this chapter contains an outline of INPUT’s conclusions and recommendations relative to Control Data and the commercial systems integration market.

INPUT defines system integration as “the provision of a total solution to a multidisciplinary information systems requirement through a single vendor.” Exhibit II-1 describes the often-confusing relationship between turnkey systems and systems integration. The primary distinguishing variables are (1) the breadth of technologies involved (hardware, software, communications; application level, data level, network level), and (2) the degree of customization required. Another way to describe differences between the two is that turnkey systems are “solutions looking for a problem to solve,” whereas systems integration always begins with a problem to solve and ends with the solution.

EXHIBIT II-1

**A****Overview**

There are a number of factors of main concern in management's view and thinking regarding corporate information systems. These factors are:

- An understanding of the importance a corporation's information system has in providing mission-critical applications and competitive advantage
- An awareness of the existing corporate investment in computer and information systems and software needs to be leveraged to the maximum extent to derive maximum return on resources expended
- An immense pressure on IS management to control or reduce expenses associated with current and future information systems expenditures

Network integration has become an important systems concern among larger corporations. Such concern is precipitated by the distribution of computing resources throughout the organization. INPUT believes this distribution will continue at an increasing rate.

The previous growth rate of information system budgets has declined. The double-digit information systems budget increases have given way to increases of 7-8% per year.

Personnel costs continue to represent the largest single item in the IS budget. INPUT estimates this item to be approximately 37-38% of the IS budget.

Systems integration projects are now more and more acceptable in the commercial sector based on the perceived success in the federal sector. As commercial systems integration successes are realized and communicated, this will spawn further growth in the adoption of this procurement approach by IS functions.

The growing impact of commercial systems integration will require the development of new skills and expertise. The importance *and* availability of these skills in sufficient quantity must not be underestimated by the commercial systems integration vendor.

B

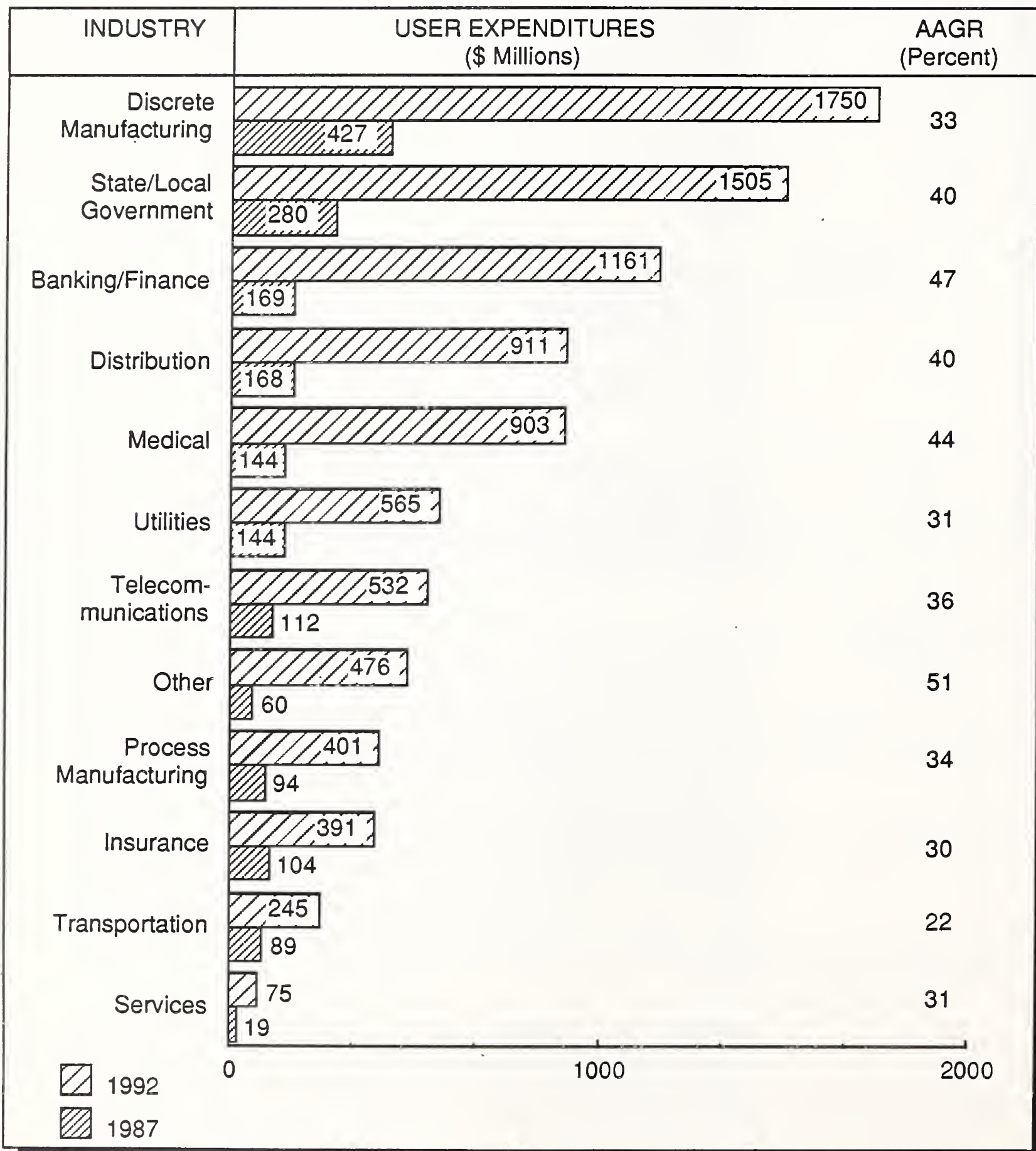
Market Forecast

As part of monitoring the opportunities in commercial systems integration, INPUT has developed a five-year market forecast. This forecast was updated to provide CDC with a current view. Exhibit II-2 shows the major industry segments, with their revenues in 1987 and 1992 and the average annual growth rate. The four largest industry segments are Discrete Manufacturing, State and Local Government, Banking and Finance, Distribution (Wholesale and Retail), which are not the four INPUT believes are the best fit for Control Data. The four industry segments that INPUT believes are the best fit for Control Data are Banking and Finance, Manufacturing (discrete and process), Utilities, and Education.

The basis for the selection of these industries within which Control Data has the best fit is an assessment of the current skills and tools currently available within CDC and/or the ability to easily acquire the requisite skills. Acquisition of these skills in this context suggests doing it in house through conscious focus on the industry or through the hiring of additional individuals with the requisite skills. Acquisition in this context does not mean buying another company.

EXHIBIT II-2

CSI EXPENDITURES BY INDUSTRY SECTOR 1987-1992



C**Conclusions and
Recommendations**

In the following chapters of this report, INPUT has identified a variety of specific commercial systems applications. The applications identified are prevalent at the current time in the various industry sectors, as reported. Some applications that are identified are currently under development and appear to be applications that will become common in their respective industry segments in the future. The report also contains a series of examples, by industry segments, of large commercial systems integration projects that are known to INPUT.

INPUT understands that CDC is using the information in this report to investigate the feasibility of enhancing its current commercial systems integration activities. Therefore INPUT would like to offer several thoughts and recommendations as to how this report information could be used in that fashion.

It should be noted that the vast majority of the commercial systems integration applications described in this report are highly customized. That is, there is very little in the way of off-the-shelf components used to provide the application capability. In fact, the very reason for system integration suggests customized specific application types generally requiring high labor content and significant expertise.

A close scrutiny of the descriptions of the various applications described in this report reveals that the applications are primarily applicable to the specific industry segment for which they are developed. Thus there is little chance of application portability from one industry segment to another. Further, within an industry segment, the buyers (users) of custom commercial systems integration applications have a keen interest in ensuring that the applications are not off-the-shelf. This is due to the fact these applications are viewed as mission critical and the very nature of the application is at the core of the competitive advantage of the client's company in its market.

Therefore if the client believes its system can be replicated by its competitor by contracting with the vendor, the client would not be inclined to continue with that particular commercial systems integrator vendor, certainly not for a packaged solution. In the very least the client wants a unique system (or application) to perform a unique function (or at least a common function in a unique fashion), so that the client receives perceived competitive advantage. [Note: The above statements express the user's perception. The vendor can have acquired insight and knowledge that can be applied to the next application system.]

The above statements are not applicable when considering generic applications such as payroll, accounts receivable, etc. These are considered to be cross-industry applications or utility functions and are not normally primary application requirements for commercial systems integration vendors. Thus, while CDC has extraordinary expertise and applications knowledge and capability in a fair number of cross-industry applications, these skills will not be very helpful in CSI.

An additional consideration, typically embedded in CSI applications, is a strong network requirement. Very few of the CSI applications are standalone systems. Instead they are normally integrated into a complex system environment generally requiring a networking function. This, in itself, drives the requirement for application customization.

CDC needs to consider that frequently the prospective client does not believe a single organization can adequately perform in all the functional areas required to develop, implement, and install a complex, customized system. It is true that most successful systems integrators (especially in large, complex projects) will subcontract portions of the application to other vendors. Clients recognize this as the norm and may be concerned when a vendor represents itself as being able to perform all tasks in an exemplary fashion. In fact, recently there has been a tendency for the client to insist that it be included in the CSI project with the client being viewed as a subcontractor.

Therefore, when considering the above, INPUT strongly recommends that CDC consider the following approach as it views its enhancing of current activities in the commercial systems integration market:

1. Appreciate and Leverage Internal CDC Skills

View the commercial systems integration market as one in which CDC can capitalize on its existing system development capabilities. That is, INPUT believes CDC can represent its systems integration strength as being the depth and breadth of its technical systems development skills, expertise, and experience. CDC's internal skills are generally comparable to those of major CSI vendors such as Unisys, DEC, and IBM.

2. Invest Internally in Key Professional Service Areas

CDC should augment its personnel skills capability by selectively adding expertise in the four industry segments INPUT believes are the best "fit" and make the most sense at this time, namely: Banking and Finance, Manufacturing (Discrete and Process), Education, and Utilities. [Note:

An acquisition of a significant professional services firm would cause a reassessment of the above four markets based on the applications expertise and industry focus of the acquired company. However, INPUT believes the four chosen would likely be important almost irrespective of the acquired company.]

3. Consider CSI Penetration as a Subcontractor

At this time, although CDC is recognized as an important information systems vendor in many respects, it is not commonly viewed as a commercial systems integrator (except in the Utilities industry sector). With this in mind, INPUT recommends that CDC seriously consider market entry into the commercial systems integration market as a cocontractor or subcontractor. If this were done in partnership with a major vendor that has an existing significant reputation in the systems integration area, CDC could facilitate its market entry into the three other industry segments (not a valid comment for Utilities). The most likely organizations are the Big Eight accounting firms, a major professional services firm, or possibly another hardware manufacturer.

4. Replicate the EMS Success Strategy

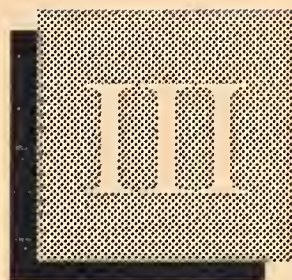
In summary, INPUT is recommending that CDC enhance its thrust into CSI by realizing its key to success is its ability to demonstrate its creativity by successfully developing systems that are unique and that will, when installed, result in a unique advantage to the client organization. This is INPUT's view of what happened with the energy management systems application.

5. Consider Leveraging Federal Sector Capabilities

INPUT also suggests that, as part of the process of augmenting the current commercial systems integration thrust, CDC look at its inventory of system components capabilities that could logically become part of future commercial systems integration projects. For example there must be some skill sets in the federal government operations that could be transferred, duplicated, or leveraged in the commercial sector. This is a part of the thinking of CSC, and INPUT believes it seems logical and straightforward for CDC as well.

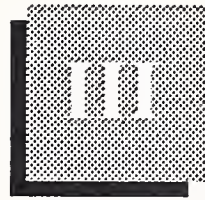
6. Pursue Strategic Alliances and Acquisitions

Finally, INPUT does recommend that CDC pursue one or more acquisitions and/or strategic alliances to accelerate penetration into commercial systems integration as well as continue to organically grow the existing thrusts into the four industry segments INPUT has recommended.



CDC Template





CDC Template

In the course of performing this custom research assignment, it became necessary to develop a “template” or “screen” with which an assessment could be made of commercial systems integration industry segments that represented a best “fit” for CDC.

This template was developed based on an insightful meeting with CDC early in May and information contained in INPUT’s files. This information is collected through the monitoring process INPUT uses to track major or contributing companies in the Information Services industry. From this data and internal discussion a template was developed to use in the industry segment selection process.

Exhibit III-1 shows INPUT’s observation and judgement about the CDC strengths and weaknesses relative to its being viewed as a commercial systems integration vendor.

EXHIBIT III-1

CDC STRENGTHS/WEAKNESSES: COMMERCIAL SYSTEMS INTEGRATION

Strengths	Weaknesses
Engineering/Scientific Process Knowledge	Industry Segment Marketing
Product Breadth	Standard Applications Software
Communications/Networks	Commercial Skills
Project Management	Magnitude of Professional Services
Education & Training	Strategic Alliances
Maintenance	Commercial Credibility
Significant Financial Resources	Financial Stability
Technology	Marketing

Most of the parameters chosen in the strengths and weaknesses are somewhat self-explanatory. CDC over the years has earned a reputation for being very technology oriented and engineering driven, which in essence is a corporate strength that can be leveraged for CSI market opportunities. Several of the strengths are based on INPUT's observation and perception of how CDC can relate to CSI opportunities. One of these strengths is perceived to be project management, which is coarsely tied to the analytical and scientific strengths that CDC possesses.

In the weaknesses side of the chart there is the general observation that CDC has not fared well in many of the commercial sectors. Thus parameters such as industry segment marketing, general commercial skills, and marketing are all aspects of what in large measure could be the lack of a previous corporate focus toward administrative applications as opposed to operational calculations. Thus some of the weaknesses are related to a heritage that focused on the technology and engineering/scientific as opposed to the commercial sectors. This translates into CDC not cultivating commercially oriented or skilled individuals, or in not setting up a strong marketing organization to focus on many of the commercial applications.

In addition, another weakness that INPUT listed is the magnitude of Professional Services. Although INPUT received the feeling that the professional services organization was strong and capable, it believes the size of the organization is not large enough to allow for the resources required to be a serious participant in the CSI arena, even if only a handful of industries are targeted. Therefore the magnitude of the organization was considered a weakness in light of the resource requirements generally necessary in the CSI market.

INPUT also believes a weakness that CDC has in the CSI market is the lack of available off-the-shelf standard applications software to provide a nucleus of applications capability for the CSI market. Although not mentioned in the chart, INPUT would also suggest that standard systems software is also not available to the extent that other hardware vendors' environments are available, but this is not viewed as critical.

One last thought from Exhibit III-1 is that the strength of CDC is in terms of financial resources but the weakness is in financial stability. INPUT has observed that CDC has a relatively strong balance sheet but has had profitability problems in the past couple of years. Even though CDC looks as though it has turned the corner, the two financial views were deemed necessary as CSI opportunities require the CSI vendor to assume significant financial risks while providing a sense of being around to finish the project. Financial instability may be overcome with several more quarters of sustained profitability.

Exhibit III-2 is a commercial systems integration internal capability or skill set evaluation of CDC based on the information sources available to INPUT. INPUT, by the way, has performed similar analyses on existing and prospective CSI vendors, so there is consistency in the approach. (See appendix for systems integration capability definitions.)

EXHIBIT III-2

INTERNAL CDC CSI CAPABILITY EVALUATION

CSI Capability	CDC Evaluation
Consulting	3
Design/Integration	3
Project Management	4
IS Hardware	4
Communication Hardware	3
Software Development	4
Packaged Application Software	2
Packaged Systems Software	2
Education & Training & Documentation	5
Network Management	4
Service & Repair	5
1 = Weak, 2 = Fair, 3 = Average, 4 = Good, 5 = Strong	

The evaluation suggests that CDC has the raw internal skills to compete in the CSI market. The obvious weakness is specific industry expertise and experience.

INPUT generally evaluates, for each of the eleven components of CSI, the strategic relationships that the CSI vendor has in place to augment their internal skills. INPUT is not aware of any such strategic alliances of CDC that would materially effect its ratings at this time.

In selecting the four industry segments to have CDC focus on, INPUT used the fine score in the internal skills, coupled with some of the limited industry expertise already available at CDC. Exhibits III-3 through III-6 describe the industry expertise that CDC can build upon.

EXHIBIT III-3

**CDC BANKING & FINANCE
INDUSTRY EXPERTISE**

- Micrognosis
- Credit Union Systems
- Loan & Deposit Accounting Systems

EXHIBIT III-4

**CDC MANUFACTURING
INDUSTRY EXPERTISE**

- Computer-Integrated Manufacturing
- Chemical/Pharmaceuticals
- Seismology/Oil Exploration

EXHIBIT III-5

**CDC EDUCATION
INDUSTRY EXPERTISE**

- Supercomputer Hardware
- Administration Applications
- Corvus Alliance
- Reputation in Educational Environments

EXHIBIT III-6

**CDC UTILITIES
INDUSTRY EXPERTISE**

- Energy Management Systems
- Energy Management Systems
- Energy Management Systems

The specific bullets in each of these Exhibits are a distillation of information INPUT has in its files, in CDC's 1987 annual report, or from INPUT's meeting with CDC in May. (Note: Exhibit III-6 is an attempt to show a very major expertise that CDC has in the utilities industry sector and is not a typographical error.)

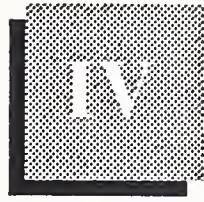
Two Points:

INPUT has developed two additional observations to assist CDC in its efforts to enhance its commercial systems integration performance. First, CDC will need to cultivate some strategic alliances to be taken seriously in the CSI market. Users are aware that no one company, not even IBM, can go it alone. Alliances show existing customers and prospects the ability to shoulder the responsibility. Examples of alliances would be in packaged applications software such as MSA or McCormack and Dodge; and communications hardware such as T1 switches from Network Equipment Technologies or any of its competitors.

Second, INPUT suggests that CDC leverage its existing skills and services to become more effective in the commercial systems integration market. As part of this leverage, CDC can use internally developed "off-the-shelf" solutions that may be considered internal to CDC but viewed by the prospect as custom. An example would be in the Utilities industry where CDC has had considerable success with energy management systems applications. Although this may be viewed as "turnkey" internally to CDC, it should always be expressed as custom to the user or prospect. Users are in a better frame of mind to pay for custom rather than turnkey application systems.



Application Systems— Four Target Industry Segments for CDC



Application Systems— Four Target Industry Segments for CDC

This chapter discusses the four target industry segments in which INPUT recommends CDC enhance its capabilities and pursue opportunities in a proactive manner. Each of the four segments is presented with a list of driving forces, current application examples, and future application examples.

In general each of these industry segments were chosen due to some or all of the following:

- CDC has exhibited some industry knowledge and personnel expertise in the chosen industry segment.
- CDC has established client relationships.
- CDC can tackle the majority of the interesting and viable applications, leveraging its core skills of project management, major engineering/scientific background, and its ability to solve technical problems.
- CDC's communications and networking experience can be effectively leveraged or modelled in many of the applications in the industry sector.
- CDC's expansive product and software development capabilities match the needs and requirements of the industry segment.
- CDC's third-party maintenance organization can be effectively utilized to meet serviceability and repair response time needs.

A

Manufacturing
Industry Segment**1. Driving Forces**

The manufacturing industry is the largest single market for any type of information services vendor. In addition to being the largest segment, the manufacturing industry is also one of the fast-growing segments. This growth is being driven by foreign competition—particularly Japanese. The manufacturing industry segment cannot be looked upon as a monolithic industry segment. There are a great variety of types of manufacturing organizations, each with their own information systems requirements.

The sheer size of the manufacturing segment has attracted a large number of commercial system integration vendors, each attempting to differentiate itself and find a market niche. For example, the process control portion of the manufacturing segment represents a sector whose various member firms have similar characteristics. These characteristics are:

- Manufacture of a product in a bulk process
- Continuous flow of the process
- High volume and highly automated

Equipment used in the process control sector tends to be extremely specialized and specific to the particular product being manufactured.

Companies in the process control sector are highly capital-intensive, with a high ratio of capital to labor.

2. Current Applications

Computer-Aided Design/Computer-Aided Manufacturing/Computer-Aided Engineering.

- Although there is undoubtedly room for additional CAD/CAM/CAE systems, INPUT believes the real opportunity in this area is for a systems integrator that can integrate, wherever possible, these various systems into an overall manufacturing system.

Computer-Integrated Manufacturing

- The opportunity of a systems integration is to take the manufacturing floor, and on a cell-by-cell basis, provide integration of the manufacturing process. This has been initiated rather successfully by Arthur Andersen and UNISYS, both of which have extensive line-manufactur-

ing models to show their respective prospects. This is, perhaps, the single greatest opportunity in the discrete manufacturing industry.

Bill of Materials Planning—the related to the assembly of components into subassemblies:

- These applications typically allow the scheduling and control of multiple assemblies with a variety of levels of subassemblies.

Product Configurators

- These applications will configure and retrieve a bill of materials for assemblies with specific model options. The system stores and maintains model information and option information. Such systems can retrieve engineering and manufacturing inventory and production information from an overall manufacturing data base.

Engineering machine control processor

- This application controls the relationship between assembly functions and the specifics of the bills of materials for these functions. Such items as starting and ending dates, engineering changes, and pending engineering changes are maintained and reported to the user. Typically this application is integrated with an overall bill of materials/production control application.

Schematic design application

- This application creates patterns and symbols from lines, arcs, and text. For example, in electrical design it assigns electrical parameters for interfacing to a routing system and to a simulation system. It also provides a network list and develops a schematic for a printed circuit board and routes the production of the circuit board within the overall production operation.

Machinery monitoring system

- These applications are designed to detect machine malfunctions in the production process, before the malfunction can affect the product being produced. Typically, these applications detect defects in machinery that are characterized and identified by changes in the acoustic signature of the machine. The software can be preprogrammed to establish alarm points on the data being managed. When an alarm point is

reached, the system can either signal a human operator or take the malfunctioning machine out of the productive flow and reschedule the production around the deleted equipment.

Quality Control Plotting

- These applications typically produce quality-control statistics and analyses of the statistics for production cycles on the manufacturing floor. They will plot the frequency and the distribution of these statistics and produce a variety of statistically derived data such as Poisson curves, or normal and exponential probability curve overlays. These applications also generate mean, range, standard deviations, and individual variants. The output consists typically of parameter tables and percentile ranks.

3. Examples

A materials management system has been developed for Detroit Edison by Electronic Data Systems (EDS). This project was completed two years ago, and EDS still provides modifications and enhancements to the system.

A just-in-time inventory control system was developed for General Signal (vendor anonymous). Information obtained by INPUT indicates that this was a project that involved development fees in the upper seven figures.

4. Emerging Application Projects

Quality Control Decision Management Systems

- This application will collect, analyze, and display variable data from the manufacturing process and from product test workstations. It will provide control charts, histograms, and scatter diagrams to identify quality-control problems. The software will have the ability to identify the relationship between the process, the materials, the workmanship, and the product defect itself.

Production and Inventory Optimization Scheduling

- Integrated information systems are being developed to integrate bill-of-materials planning, materials resource planning, shop floor control, master production scheduling, purchasing, and cost management.

These applications can support a single plan, or multiple plans, using one explosion of the bill of materials. The system encompasses both production scheduling and production planning.

B

Banking and Finance

1. Driving Forces

The financial industry segment is the most de-regulated segment in the U.S. Historic regulation normally suggests a high degree of standardization and to some extent this is true. However, because of competitive pressure financial institutions are beginning to show great diversity in their marketing and operations and thus in their information system requirements.

These same competitive pressures are creating the need for product diversification based on innovative information systems. These new products, in turn, generate the need for a variety of new systems to support them. In banking and finance, data processing is the equivalent of the “factory/manufacturing plant” and hence receives a high-priority claim on corporate resources.

In addition, competitive pressures are creating a note of instability in the financial sector—a level of instability that was rarely present in the past. For example, major banks such as Continental Illinois and the Bank of America have been on the verge of bankruptcy. More recently there have been a rash of major failures of savings and loans throughout the U.S., putting a strain on the FSLIC.

There is a marked industry trend at this time that reflects a consolidation of financial institutions throughout the U.S. This consolidation is characterized by the following types of events:

- Commercial banks acquiring savings and loans
- Interstate Banking
- Major banks acquiring smaller banks and bank holding companies, on both intrastate and interstate basis

There has been considerable pressure on Congress to loosen or repeal the Glass-Steagall Act. The recent market crash (October 1987) has reduced these pressures and it seems that, at least for the time being, the Glass-Steagall Act will remain in place, ensuring the separation of banking and brokerage organization and activities.

2. Current Applications

Customer Information File

- The customer information file, in the context of financial services, has been under development, in various ways, for many years. However, relatively few multiproduct financial service organizations have a complete, centralized customer information file. Such a file is vital to support a highly integrated, full-scale financial services organization. The development effort to create such a system is immense; yet a vast market awaits the systems integrator that is able to develop and install such a system.

Third-Party ATM/POS Services

- The demand for increased quantity and quality in electronic banking services is immense. At this time, electronic banking has basically involved standalone ATM or POS systems. The ability to effectively and economically link a variety of these systems together, to facilitate more convenient financial transactions at the retail level, represents a prime opportunity for any systems integrator.

Trust Accounting

- Integrated system applications for trust accounting are applicable to small, medium, and large banks. Trust, IRA, and farm accounting systems are frequently included within a trust accounting system. Also frequently included are stock investment reviews, asset maturity maps, market value updates, and stock and bond portfolio reporting. Depending on the particular requirements, a trust accounting system can also handle direct and indirect lease accounting.

Fixed-Assets Accounting

- These applications can be used within the financial institution itself in relation to major-client accounts. They allow for a variety of depreciation methods and generate monthly depreciation accruals and schedules. A key element of these systems is their ability to provide advance warnings related to assets approaching salvage value. These applications typically offer a multiyear projection of depreciation expenses.

Forced Closed Accounts Systems

- This type of system allows a bank to take a closed account, within which there are losses, and distribute the losses throughout multiple general-ledger accounts within the bank. The system allows inquiry and changes to the system's data base, and handles the creation and resequencing of bad loan data. The system reports and lists the forced closed accounts and sorts them by a variety of methods for general-reporting purposes.

Branch Customer Information System

- These systems are typically integrated systems and designed for use at the branch level. They support demand deposit accounts, savings accounts, CDs, installment loans, credit cards, and ATM usage statistics. Data is combined into a centralized report of customer/account information. These reports summarize various transactions and normally include a daily audit journal. These systems typically have multiple-access security levels.

3. Other Examples

- Claims Processing
- Loan Processing
- Electronics Funds Transfer

4. Emerging Application Projects

International/Domestic function Integration

- These applications are designed to incorporate international banking functions into a commercial bank's operations. Subsystems include such functions as foreign exchange, foreign exchange exposures, balances and positions, placement and loan transactions, money transfers, wire transfers, letters of credit and bankers' acceptances, and multicurrency accounting.

On-Line Banking System Reconcilement

- These systems are designed to eliminate the lengthy and labor-intensive batch-proofing operations at the end of the banking day. The reconcilement is done on-line during the check-processing application. The

key goal of the application is to detect single free items and out-of-balance deposits. The application automates the manual aspects of check reconciliation and eliminates the need for manual searches for the specific data required in the reconciliation process.

Bank Calling Officer's Workstation

- These integrated systems store data describing sales people, bank branches, regions, customers, and prospects. Data can be organized by SIC codes or bank products. The system tracks sales call activities by prospects, customer, calling officer, branch, product, and industry. The most sophisticated versions will provide credit evaluation and other decision support tools.

Wirenet Funds Transfer and Management Systems

- These systems integrate and interface Fedwire, Bankwire, SWIFT, Telex, and TWX. They contain preformatted message templates and the automated data mapping related to wire service formats, security, advice generation, and record storage. The system tracks the bank's position at the Federal Reserve Bank and allows for demand deposit accounting and general-ledger posting.

C

Utilities

1. Driving Forces

The utilities industry is divided into three major categories or sectors:

- Electric
- Gas
- Water and sewage/waste disposal

The utilities industry is highly regulated and monopolistic, setting it off in certain characteristics from other industry segments. In an essentially noncompetitive business, "mission critical" applications become those that provide internal advantages to the utilities. As a result, more CSI opportunities show up in administrative application areas than in other vertical markets.

The computer systems used in the operations side of utility applications combine real-time process control applications with engineering and technical simulation.

Because of the highly regulated nature of the utilities industry, the financial and administrative applications combine business-oriented information with state and local regulatory compliance applications.

The utilities industry is currently going through a period where there is significant hardware and software obsolescence.

2. Current Applications

Utility Billing

- There are a variety of billing applications in existence within the utilities industry. Typically these applications contain the following functional capabilities:
 - Variable period statements
 - Customer listing with aging
 - Delinquency and last-payment information
 - Master list of service codes
 - Calculation of finance charges
 - Account aging
- Within the context of utility billing, there are a variety of interface capabilities; typically utility billing packages interface with the utility's general-ledger package.

Outage Reporting Systems

- These systems contain a data base concerning details of all distribution outages. The systems determine reliability levels and pinpoint areas with high outage rates. In certain cases, the systems can determine emergency crew needs and assess the efficiency of emergency procedures and personnel.

Revenue Generation Simulation

- These systems are applications to both electric and gas utilities. They simulate revenue generation based on various type of forecasts concerning weather, and other factors concerning demand.

Utility Customer Service Systems

- These systems maintain a complete customer profile within their data base. They include applications such as budgeting, billing, service

orders, cash management, deposits, credit and collection, usage estimates, and deferred payment agreements.

3. Examples

- Automated Meter Reading
- Customer Billing Information Data Base Development
- Job Order System
- Personnel Accounting System

4. Emerging Application Projects

Mapping applications

- These systems are used to monitor and teach the location of the utilities' facilities for delivering its services to its customers. The systems are used for locating facilities for service considerations and are used to inform others to ensure no conflict with other constructions.

Energy Management Systems

- These systems monitor the energy system to regulate the network of substations. The energy systems controls all feeder circuits and the flow of power throughout the power grid.

Interactive Utility Systems

- These tend to be multicompany, multicycle systems. They can provide the user with current and historical account data for all utilities used by the customer. The systems provide actual current billing applications as well as generate historical data. For example, some can produce reports containing previous consumption history by periods, purchase capabilities, and the financial history of each customer.

Construction Management System

- These systems are oriented toward both electric and gas utilities and involve construction planning, estimating, and control systems for future construction projects.

On-Line Customer Information Systems

- These are interactive, on-line data-base-oriented systems and include both billing from the data base and on-line information systems for customer service purposes. They allow all information, including cash and meter readings, to be updated in real time.

On-Line Transmission System Planning

- These systems are oriented toward electric utilities and are designed to evaluate the alternative transmission expansion plan for the utility. The system can measure the effects of expansion plans on the utility system and can calculate a performance index for each planned system, so that the various plans can be compared quantitatively. Problems caused by any plan can be isolated by the system, and the system will allow the user to examine various aspects of the plan, in various levels of detail. These systems are also designed to generate information for submission to various regulatory agencies.

D

Education

1. Driving Forces

Most post-secondary institutions are in a period of consolidation as a reaction to meeting significant budgetary and cost constraints.

Most four-year colleges and universities now adopt aggressive marketing techniques in order to attract good students and faculty members.

The administration of most post-secondary educational organizations is aware that computer literacy is an important part of student education. However, their approach to providing computer literacy is often fragmented and uncoordinated.

Two-year colleges and vocational schools are also increasing their attempts to provide various forms of computer literacy.

There has been a dramatic increase in the academic use of computers in primary and secondary schools throughout the U.S.

A significant number of high schools, elementary schools, and vocational schools are using computers for academic and administrative functions.

School systems at the elementary and secondary levels are prone to form cooperatives so they can take better advantage of computer systems.

2. Current Applications

Fund Accounting

- Fund accounting systems can either include or interface with accounts payable, accounts receivable, general ledger, payroll, and other types of financial systems. Basically, these systems generate cash requirements, showing cash flow needs over various time frames and an audit trail for expenditures during the past several accounting periods. These systems also maintain up to 40 to 50 account funds, providing a variety of transactions for accounts per fiscal period. The systems also prepare reports on individual funds and generate detailed transaction journals.

Transportation Analysis Systems

- These systems are basically oriented toward school systems where pupil transportation is an important element of the overall administrative function. These systems pertain to all aspects of the school district's transportation policy, including maximum and minimum loadings, early pick-up times, starting and dismissal times, and, taking all of these factors into consideration, produce a unified routing system. They typically generate transportation summary reports concerning vehicle miles, reimbursable pupil miles, etc.

Student and Class Scheduling

- These systems are in common use in most higher and secondary educational institutions and allow the scheduling of students and classes, and the interaction between the two groups of variables. These systems are typically performed on a batch basis, but currently there are a large number of systems, especially in the higher education institutions, that perform these functions on an on-line basis.

3. Other Examples

- Student Aid System
- Computer-Aided Instruction
- Office Automation

4. Emerging Application Projects

Financial Aid and Management Control Systems

- These systems are beginning to emerge in post-secondary educational institutions. They support the U.S. Office of Education and state financial aid requirements for student reimbursement purposes. They typically operate through an interface with the institution's data center and support the complete array of financial aid available to students.

Student Information Systems

- These systems vary significantly in their scope and are basically installed at the college and university level. They are able to track a student from initial application to alumni status.

Student Loan Systems

- These systems provide record keeping and loan information, from application through final loan payment. They tend to be developed to support federal, state, and private loan reporting requirements. Systems under development enable an on-line enquiry capability and the automatic generation of vouchers, checks, promissory notes, repayment schedules, etc. The more sophisticated systems provide an audit trail, multischool capabilities, and user-defined processing rules and regulations for the system.

E

Summary

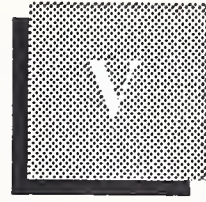
These four industry segments have a considerable amount of potential for CDC and take advantage of areas of expertise and capability that CDC possesses. Commercial systems Integration is an activity that requires intimate industry knowledge that can be used to creatively solve the needs. CDC has the requisite industry knowledge or skills (based on the inventory of professional services staff) to make considerable penetration and compete in the aforementioned industry segments.

If other industry segments are of interest, for factors beyond this study, then INPUT recommends that CDC make a formal acquisition to bring some industry knowledge and expertise in house. This would be accomplished by an acquisition similar to the one Computer Sciences made in 1976 when it acquired Computer Partners.



Application Systems— Other Industry Segments





Application Systems— Other Industry Segments

This chapter discusses the remaining industry groups and the applications that are occurring as part of the commercial system integration thrust INPUT is monitoring. These industry segments were not selected for some or all of the following reasons:

- It was INPUT's assessment that CDC did not have the required skill set and industry experience to effectively compete in these industry segments.
- There was no overall fit with the nature of the applications required in these industry segments and the internal developmental skill set currently available at CDC.
- The applications tend to be more "administrative" versus "operations."
- CDC has not attained an "image" in these industries for providing general-purpose solutions, thereby being at a competitive disadvantage.

However, in spite of this, INPUT did develop a 2nd tier of candidates for industry focus based on evaluating the overall capabilities of CDC and matching them with the applications potential in the 2nd-tier industry segments. The second-tier industry segments are Distribution (Retail and Wholesale, mostly wholesale), State and Local Government, and Telecommunications. These industry segments do have an "operations" flavor that is compatible with CDC's internal CSI capabilities; selective marketing efforts could be used effectively.

INPUT believes each of these industry segments could be developed by picking a couple of applications that CDC can master and propagate them much like energy management, lottery systems, and credit union services. For example, in State and Local Government the pilot efforts in mapping using the scanning services capabilities could catapult CDC into providing mapping services. In Telecommunications, operator scheduling and accounting systems is an application that seems compatible with CDC's skills, and in Distribution the scheduling of routes and product distribution would be an example.

In the following sections, the 2nd Tier and remaining industries are presented to allow CDC to obtain additional insight.

Second Tier Vertical Market Targets

A

Distribution: Retail and Wholesale

1. Driving Forces

The use of various types of computer systems and digital communication networks has allowed wholesale distribution to adapt their modes of operations to the specific needs of the industries they serve. These various adaptations have led to a rapidly increasing market for customized turnkey systems in the wholesale distribution industry.

- Turnkey systems have always been, and are likely to be, an important part of the wholesale distribution industry.
- In the retail distribution sector, the requirement for advanced inventory control systems and the support of point-of-sale terminals has become important in the market for integrated services.
- There is a direct systems link between point-of-sale systems and inventory control systems. Each retailer seems to look upon his requirements for these combined systems in a different way.
- Even small retailers have been, through competitive pressures, forced to automate their operations. Although a small retailer normally cannot afford high levels of information services expenditures, it may still be necessary for them to purchase a customized turnkey system to support their retail operations.
- Product and market diversification and geographic expansion will be key activities for wholesale distributor firms during the course of the

next five years. Data communication and integrated systems will be a leading factor for this type of expansion.

2. Current Applications

EDI Systems

- The requirement for a comprehensive electronic data interchange (EDI) system within the distribution industry is extremely pressing. The need to rapidly pass electronic records representing various types of transactions within the industry and between the distribution industry and banking is crucial. The systems integrator that can design and install an EDI system for the distribution industry will find a strong demand for a network product. Since CDC has a processing service for EDI (i.e., REDINET), it stands to reason that it could be a strong possibility for that CSI vendor role.

Point-of-Sale Systems

- These systems are important in both the wholesale and retail portions of the distribution industry. To date, POS systems have gained greatest acceptance in the retail industry, but are now becoming more prevalent in the wholesale distribution industry as well. The need to enhance these systems and integrate them directly with inventory control and inventory planning systems remains a key future application.

Small Store Inventory Management

- These systems maintain perpetual inventory control for single-store or multistore locations. The systems process daily sales and provide daily, weekly, and monthly sales analysis and statistics. The systems also process delayed shipments and backorders, as well as produce mail lists, letters of credit, and trade acceptance documentation. The systems typically interface with point-of-sale cash registers for the entry of daily sales.

Retail Merchandise Control Systems

- This system provides merchandise control, including a purchase journal, analysis reports for merchandise transfers, markdowns, price changers, etc. It also provides sales order entry data and summarizes daily sales, by store and cash register, and provides for cash balancing at the end of the sales day. The system may also provide for the inter-

face of POS systems. It also may interface to a general-ledger, accounts payable, and/or payroll system.

Small Distributor Multiwarehousing Control System

- This system can provide single-warehouse or multiwarehouse control systems for small distributors and also allows for inventory transaction editing and posting within an edit list and journal. The system provides a detailed LIFO/FIFO cost history. It also typically includes price lists, stock status, inventory value, purchasing advice, and usage reports.

3. Examples

- Inventory Control
- Merchandising Information System
- Store Business System
- Warehouse Control
- Network Integration

4. Emerging Application Projects

Store Resource Management System

- Plans, reports, and controls how people and equipment resources are used within a retail store environment. Maintains daily sales and percent distribution of sales for different time periods during the day. May keep a history of customer service by recording the average and maximum number of customers awaiting service at checkout positions. In general, these systems allow various store areas to compute fixed and variable manpower requirements by time-frame and can create departmental work schedules.

Retail Store Inventory Management System

- This system works in conjunction with an overall inventory management system and is basically oriented toward tracking markdowns and sales of markdown items for various periods of time. It prints audit tracks, inventory report stock item status, and markdowns by specific vendors and specific departments. It is basically aimed at allowing a discounter, or a normal retailer entering a discount market, to control and project discounts and compare profit margins as items are discounted over time.

Warehouse Control System

- These systems support the entry, maintenance, picking, shopping, and tracking of sales orders. They may be designed to handle multiple warehouses, multicompany, multiregion, and multidivision capabilities. These systems are applicable to both wholesale distribution and the distribution function within a manufacturing organization. A current key element is the use of these systems in various field locations on a turnkey basis, with feedback to a centralized system at the corporate location.

B

State and Local Government

1. Driving Forces

There is a strong degree of commonality in information systems application throughout both state and local governments. Functions are essentially the same and variations in function, from one level of government to another, are not significant.

Although state and local governments (in particular, local governments) were among the last industry sectors to automate, their automation is currently quite extensive.

State governments are heavy users of mainframe computer equipment and tend to be centralized in their data processing applications.

Local governments, except for major cities, are more oriented toward mini- and microcomputer applications. In many cases, state and local information systems include applications from other industry sectors; for example, health, education, and utilities.

Because of standardization and budgetary limitations, the S&L government sector is, on a proportional basis, one of the lowest ranked users of customized software services.

Whatever the application, and in almost every case, S&L governments are required by law to engage in competitive bidding for any type of information system.

2. Current Applications

Mapping Applications

- These systems are required to track the water and sewer facilities that are typically the responsibility of the local municipalities. These systems are important to allow the construction industry and others to know the precise location of facilities to tap into or avoid.

Revenue and Expense Projections

- These systems are used to develop a profile for a municipality's revenue stream from taxation and associated sources. They include residential, commercial, and other types of property, from both an assessment and tax generation perspective. These systems also frequently include tax valuations and the ability to project new valuations and tax receipts for each specific property and type of property. Where appropriate, water and sewer revenues and expenses are included.

Tax Assessment and Collection Systems

- These systems are, in essence, a real and personal property tax administrative system. They include property appraisal, assessment, and billing functions.

Building Permit Processing Systems

- These systems provide the storage and retrieval of building and other permits as they are administered by local governments. The systems normally handle residential, commercial, and industrial building permits, as well as electrical, mechanical, plumbing, and other types of permits. The systems typically calculate fees, determine critical dates, and track various types of permit review functions.

Municipal Utility Billing

- These systems handle metered electricity, water, sewer, garbage, and other types of utilities monitored or provided by municipal governments.

Vehicle Registration System

- These systems can be either batch or on-line and encompass the recording, maintenance, and reporting of information concerning registered vehicles. These systems are designed to allow the reporting of information to the vehicle registrar about vehicle registration and vehicle lists. These systems project vehicles to be registered by month for varying times into the future.

Municipal Court Scheduling System

- Develops and prints court docket schedules by court date, session and type of court. These systems typically provide history tracking for each type of violation and type of court case. The systems also monitor, track, and report on the payment of fines, sentencing, probation, etc.

3. Examples

- Driver Registration System
- Child Support System
- Expenditure Management System
- Social Services Client Data Base
- Voice/Data Integration

4. Emerging Application Projects

Fund Accounting Information Systems

- These turnkey systems are on-line, interactive accounting/cash management systems. Typically, they include general ledger, budgetary accounting, account payable, vendor management, grant/project accounting, cash receipts, encumbrance control, etc. They are also able to generate checks and 1099 forms for various types of public service agencies.

Budget Modeling Systems

- These are on-line forecasting and budget preparation systems for state and local government. They provide current and historical data for use in preparing budget requests.

Fiscal Modelling Systems

- The more complex and complete systems that are under development include the creation and maintenance of all line item accounts, titles, program descriptions, and allocation bases and tend to provide historical information in support of a financial modelling process.

Crime Analysis Systems Support

- Supports the crime analysis needs of various law enforcement agencies. Provides the user with the capability of crime pattern detection, crime/suspect correlation, target profiles, crime potential forecasting, and exception reporting.

C

Telecommunications

1. Driving Forces

Deregulation and the increased diversity in the U.S. telecommunications market has led to the requirement for more-sophisticated tools to plan and manage new communications channels such as satellites, fiber optics, and new types of data networks. The recent upheaval in the telecom industry in this country and the resultant mergers and acquisitions, consolidations, and deregulatory activities are creating significant new opportunities for information services vendors.

By its very nature, the telecom industry has always been capital intensive.

The various types of telecom organizations have been early and substantial users of information systems services.

2. Current Applications

Telephone Management System

- These systems include call costing for individual users and the ability to output related data. These systems compute the cost of calls identifiable by station and/or extension. These systems also store commonly used names, addresses, and phone numbers for speed dialing and provide for the automatic activation of discount long-distance service.

Network Design and Management Systems

- These systems provide automatic design and management for distributed processing configurations and also provide a data base management system for the inventory of equipment, lines, and network design. They provide design, management, analysis, and optimization of distributed processing networks for both single and multistage network design. They give the user the ability to design all or part of a network and design telecommunications topology for geographically diverse data networks.

Telephone Traffic and Accounting Systems

- These systems process station message detail records and exchange message record formats. They also enable the vendor to develop customer charges and allocate these charges as a percentage of the direct-dialing rates. These systems are typically categorized into two separate areas:
 - Billing and Accounts Receivable
 - Traffic and Network Analysis

3. Examples

- Office Automation
- Customer Information System
- Voice/Data Network Integration

4. Emerging Application Projects

Automated Billing Financial and Administrative Systems

- These systems are newly designed to support cellular radio systems, as well as long-distance and local telephone networks. They process call detail record data, pricing, and invoice production with an interface to accounts-receivable packages. Systems under development also provide for on-line correction of errors, data base updates, traffic statistics, and on-line management reports.

On-Line Data Collection Using Portable Data Collection Terminals

- These systems provide for a variety of input devices, including unattended 24-hour remote data devices via multiple telephone lines. Bar

code readers may be attached to portable storage terminals. The systems are designed to be used in industrial, retail, and distribution applications. Typically, these applications include remote order entry, inventory data collection, manufacturing item control, branch location reporting, retail sales reporting, etc.

Cost Allocation Traffic Analysis Systems

- These consist of a series of data base management modules, each module designed to perform a specific task in accumulating and organizing telephone data for decision making and the control of telephone and telephone-related expenses. The system provides cost allocation capabilities, budget performance, flexible reporting and historical expense structures.

The above three industry segments describe the 2nd tier of industries that have a fit for CDC based on CDC's internal skill set and the inherent nature of applications that are mission critical and operations oriented.

The following industry segments complete the major industries monitored by INPUT as part of the commercial systems integration activity. CDC may be able to develop an application system that could represent an important thrust in these industry segments on an opportunistic basis. INPUT does not recommend that CDC force itself into these industry segments based on the information it currently has in its possession.

Remaining Vertical Markets

D

Insurance

1. Driving Forces

The insurance industry can be subdivided into four sectors:

- Life Insurance
- Property/Casualty Insurance
- Health Insurance
- Reinsurance

The insurance industry is highly regulated; this is true for each of the various subsectors within the industry.

Although an important part of the U.S. economy, the insurance industry has been one of the least dynamic industries throughout its history.

The major competitive threat to organizations in the insurance industry is that of being acquired by other companies that are attempting to form complete financial services organizations.

Cost control, especially in the life insurance and property/casualty insurance areas, has become an important focus for the major insurance carriers. Cost control normally focuses on the company's agency structure. Many insurance carriers are finding ways to reduce the number of agents and agencies.

2. Current Applications

Financial Needs Analysis Systems

- These systems are utilized by insurance agents and can calculate the amount of insurance required for cash and income requirements. The systems typically include Social Security benefits and user-designed interest and inflation assumptions.

Claims Management Systems

- These systems include credit insurance administration and state reporting requirements. They maintain files of creditors; certificates; incurred claims; and disability, life, and mortality factors.

Group Administration Systems

- These systems capture data regarding policies, subpolicies, billing groups, agents, class descriptions, and coverage data. They generate reminder listings, notices, premium bills, and late and lapsed listings. These systems are basically designed for the administrator of group insurance policies.

Claims Processing Systems

- These systems perform the following functions:
 - Claim eligibility
 - Claim pricing
 - Benefit calculations
 - Applicability of deductible limits

- Typically these are turnkey systems, and they interface with a variety of other systems, both at the agency and corporate levels.

3. Examples

- Insurance Agent Automation
- Communications Network Development
- Flexible Life Insurance System
- On-Line Customer Information System

4. Emerging Application Projects

Customer Information Systems

- The insurance industry is beginning to express an interest in developing on-line customer information systems similar to those already in use in the banking industry. These systems will allow single-file access to all customer policies and activities, rather than accessing a customer's policies within each product line, as is now normally the case.

Interactive Loss Analysis Systems

- These systems analyze various types of insurance losses and provide for automatic take-down and release calculations. The systems report loss by product line, state, type of policy, etc. They also enable the user to maintain loss and expense information, separately and by product line.

Turnkey Agency Management Systems

- These systems are basically oriented toward the independent insurance agency. They provide for client profiling, prospecting, and solicitation capabilities; and sales analysis reports. There are also agency accounting applications, client file and policy information, and the ability to generate new policies and proposals on an on-line basis.

On-Line Quotation Systems

- These systems are designed to enable the corporate agency, or the independent agency, to generate quotes and proposals for insurance policies on an on-line basis. They include the calculation of premium, a word processing capability, and the ability to access data bases for direct-mail capabilities.

E**Medical Industry****1. Driving Forces**

The medical and health services sector has changed dramatically during the past several years. The current emphasis on cost containment and the type of reimbursement plans for health services have caused great changes in the health industry itself. These changes have, in turn, had a marked effect on the information services aspect of the medical and health services industry.

More-efficient and complex information services are in demand in order to support the reporting associated with health-care reimbursement.

There has been an increase in the diversity of health-care organization. For example, health maintenance organizations (HMOs), together with prepaid plans, home health agencies, and free-standing emergency centers, have all added to the complexity and diversity of the health-care industry.

Although hospitals continue to be the primary vendors of health-care services, their relative degree of importance is declining rapidly.

Individual medical practitioners are now being displaced by group practices.

A new factor in the medical and health services industry is competition. Hospitals and other health-care organizations are now, more than ever, competing for patients and physicians. Information systems could be a determining competitive factor in establishing the level of health-care service a particular institution can provide.

2. Current Applications**Image Analysis Systems**

- These systems include the analysis of many types of images: metallographs, x-rays, autorachograms, and electrophoresis gels. Systems allow measurement in two and three dimensions. The systems typically print values for later analysis by the medical practitioner.

Medical Billing Systems

- These systems encompass billing, collection, and statistical gathering for all types of medical practitioners. The systems are frequently custom tailored for specific medical specialties such as cardiology or pathology. They enable the accumulation of fees until patient discharge. In addition, these systems are able to generate specific customized messages on statements, dunning letters, and optional writeoffs on certain accounts. Many of these systems also include management reports, patient and insurance statements, and a detailed audit trail.

Long-Term Care Resident Management Systems

- These are turnkey systems that pertain to health-care facilities. They include admissions, discharge, and transfer applications, as well as the generation of patient census days and revenue and census tracking, by billing and patient type. The systems are typically able to build variations such as room and board charges, ancillary charges, and other types of charges pertinent to the individual health-care facility. They typically interface with general-ledger and Medicare/Medicaid types of insurance billing systems.

Health-care Cost Accounting Systems

- These systems are normally applicable to hospitals or other types of complex patient care facilities. They facilitate the development of costs for each service unit in the health-care facility. They are able to monitor the activities in health-care facilities by department and produce dollar volume and dollar variant figures by department.

3. Examples

- Hospital Information System
- Automated Diagnostic System
- Patient Billing System

4. Emerging Application Projects

Automated Diagnostic Systems

- These systems are a series of systems under development that will run differential diagnosis on any combination of 300-400 common, acute diseases or conditions. These systems typically incorporate a disease

reference module that displays symptoms associated with any of the stored diseases. A system is able to compare the input of symptoms with stored symptoms, by disease, and to print out diagnoses and references for the use by the internist or other health-care practitioner.

On-Line Patient Information Systems

- These systems (under development) provide on-line access to historical patient information. They extract data through an interface to a patient data management system and provide a reference for the medical records departments concerning all data pertaining to patients. The systems are also able to establish a retrospective statistical study for the health-care institution and provide data to the business department or regulatory agencies.

Health-care Financial Management and Modelling Systems

- There are a variety of turnkey systems that provide financial support to the administrator of a health-care facility. These systems are basically made up of three separate modules:
 - A budgetary module, which handles expense, revenue, and labor; and payroll budgeting and monitoring
 - A reimbursement and profit-and-loss modelling system
 - A report-generating module for state and federal regulatory filing
- These systems can generate budget systems, pay or reimbursement analyses, profit and loss forecasts, and reimbursement maximization possibilities.

F

Services

1. Driving Forces

The services Industry, as defined by INPUT, consists of the following segments:

- Accounting
- Legal Services
- Architectural and Engineering Services
- Real Estate
- Business Services

- Business Consulting
- Advertising
- Mathematical modelling of the economy and of business problems is an important aspect of the use of computers in the business services subsector
- The unifying feature in the services subsectors is that the product is people-oriented and labor intensive. Therefore, computer applications in the services industry focus on improving personnel productivity.
- Computers are enabling the accountant to change from a strictly financial role to a more sophisticated analytical and advisory role.
- The real estate subsector is becoming more dependent on computers for marketing, as well as for management functions.
- The computer services subsector of the services industry is more of a provider of information services than a consumer of information services

2. Current Applications

Advertising Management Systems

- Designed for small-to-medium-sized advertising agency and public relations firms, these systems include a variety of functions such as:
 - Time/media billing
 - Agency business analysis
 - Project estimating
 - Financial applications, such as accounts receivable, general ledger, and budgeting

Media Scheduling Systems

- These systems establish media schedules at the beginning of media plan year and track budgeted versus projected costs and activities.

CPA Client Write-Up Systems

- These systems provide financial statements for each client, including end trails, batch balancing, and, where appropriate, after-the-fact payroll.

Practice Management

- Most professional organization in the services industry require the use of some form of practice management system. These systems keep track of time and expense, by professional employee, and provide an objective criterion for evaluating staff performance and client profitability.
- The systems usually include detail work-in-progress journals, work-in-progress reports, unbilled fees, and a client service analysis capability.

Litigation Support Systems

- These systems, developed for law firms, have the capability of searching names, dates, document types, and characteristics and information describing deposition and trial exhibit numbers. They are used by group practices, or sole practitioners, to develop data to support litigation.

Property Management Systems

- These systems are applicable to multiunit real estate management companies. They provide property, leasing, and rent control statistics; management reporting; and cash flow analyses. They also will provide a detailed cost-reporting capability, together with vacancy reporting, notification of future vacancies, lease renewal notices, etc. Optionally, these applications can include payroll, job costing, financial modelling, etc.; typically they interface with other systems providing these applications capabilities.

3. Examples

- Local-Area Network Development
- Legal Information Retrieval System

4. Emerging Application Projects

Because of the great diversity of industries within the Service Industry sector, it is a practical impossibility to delineate what applications are being developed for this industry sector. As a sector, it is an agglomeration of various industries without any real correlation across industries, except that they are labor intensive.

As can be construed by the above statement, most new applications oriented toward the services industry are aimed at creating a more efficient labor force. This is true whether the particular organization is a professional services company, such as a law firm or CPA firm, or a real estate office or travel agency.

The development and market acceptance of the microcomputer has made the automation of this industry a reality in the last 5-6 years. The industry is mostly small firms that are not able to afford a minicomputer or mainframe-computer-based system; thus the use of microcomputer-based systems has become common throughout the services industry.

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Transportation

1. Driving Forces

Deregulation of this industry has contributed to increased competition and increased consolidation within each of the transportation segments, as well as causing increased competition among the various modes of transportation.

Since industry deregulation has occurred, cost containment and increased productivity, together with improved service levels, have become increasingly important in all phases of the transportation industry.

The railroad industry continues to move toward fewer and larger railroads.

The airline industry has gone through several phases of consolidation and increased competition. The demise of People's Express has led to decreases in fare reduction pressures in the industry and thus, at least temporarily, the industry is returning to an era of fare stability.

Several of the larger transportation companies have developed systems applications internally and are providing information services to other outside organizations.

Although most transportation companies are capital intensive, the trucking industry is a large number of small carriers. Therefore, while statistically attractive, the trucking industry is, in many ways, the least attractive mode within the transportation industry segment for information services vendors.

Recent advances in telecommunications technology now allow transportation companies to control their operations at the vehicle level.

2. Current Applications

Automated Truck Routing

- These systems produce driving routes, mileage, travel time, and fuel usage for different pick-up and delivery routes. They typically contain a data base of a large number of cities and road junctions throughout the U.S. and compute the shortest route between cities. Variations involve avoidance of tolls and pay roads.

Vehicle Maintenance

- These systems provide preventative maintenance schedules and the historical cost for vehicle repairs. Maintenance can typically be based on mileage, hours, elapsed days, or specific dates. Historical labor and material costs are typically maintained, and fuel usage reports are also generated.

Flight Load Optimization

- These systems determine optimum aircraft load distribution and fuel loads. They also perform preliminary and final center-of-gravity calculations.

Market Analysis Systems

- These systems extract summary data from on-line passenger service systems and analyze it to identify new markets, yields, revenue and traffic, and earning data. They are normally applicable to airline operations but can be applied to bus and railroad operations as well.

3. Examples

- Automated Train Control
- Office Automation
- Expansion of an On-Line Reservation System
- Personnel System
- Reservations System Development

4. Emerging Application Projects

Equipment Management Systems

- These are turnkey systems to provide maintenance and operating data for fleet management. These systems integrate vehicle repair orders, parts inventory, labor, and fuel costs. They track the fixed and operating costs associated with each vehicle in a fleet. They can schedule preventative maintenance as well as report on depreciation/vehicle class analysis, etc.

Cargo Movement Control

- These are applicable to air and surface transportation companies. They enable the user to determine the location of any shipment as well as its movement throughout the transportation system. They are also able to predict and control available space and reserve and allocate this space to cargo shippers. More-advanced systems generate waybill data and reports concerning the utilization of the resources with the transportation system.

Integrated Preventive Maintenance Scheduling System

- These are preemptive maintenance scheduling systems for equipment and vehicles. They use mobile data collection devices, including electronic data collectors at service islands, to collect key daily servicing data. The systems are capable of generating daily reports that include preventive maintenance schedules, vehicles not service, defects, vehicle fuel efficiency, and warranty reports.

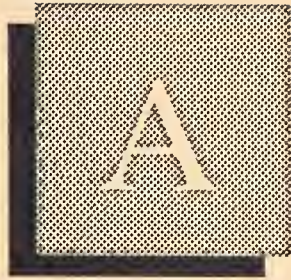
Transportation Route Modelling

- This enables a user to develop a set of supply points and customer demands, and to adjust the transportation network to optimize the relationship between customer demand and the transportation supply points. It is used to develop the quickest, shortest, or least expensive way for travelling or for shipping an item between two points.

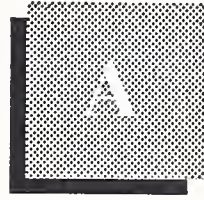
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“Other” Industry

The “Other” Industry segment is an accumulation of essentially miscellaneous U.S. Department of Commerce SIC codes to include the rest of the U.S. economy. It consists of many small splinter industry segments such as not-for-profit organizations, museums, charities, etc. INPUT has not observed any of these organization having the need for a commercial systems integration project.



Appendix: Systems Integration Capability Definitions



Appendix: Systems Integration Capability Definitions

1. *Consulting Services*—Project front-end feasibility studies, and/or hardware or software, network technology selection, and trade-off studies.
2. *Design/Integration*—System design, installation, and testing.
3. *Project Management*—Overall responsibility for project planning, implementation, vendor and user interface.
4. *Information Systems Hardware*—Processing CPUs, storage and related peripherals used in a SI project (mainframes, minis, micros).
5. *Communications Hardware*—Communications devices, e.g., controllers, switches, multiplexers, network control systems, PBXs.
6. *Software Development*—Custom software design, coding, and testing.
7. *Package Application Software*—Vendor-provided off-the-shelf generic software solution to a given application requirement.
8. *Packaged System Software*—Vendor-provided off-the-shelf generic software solution to system requirement.
9. *Education, Training, & Documentation*—Training given to the user to make some combination of the use, operation, and maintenance of a system possible by that user.

10. *Network Management*—The ongoing operation, monitoring, and control of a communications network as a facility management service.
11. *Service & Repair*—Services that fix operational problems in hardware, software, and any special facilities/equipment.
12. *Other*—Specialized systems required by, and unique to, the SI project application. For example, an energy management system for a power utility will have special controls and switches (using computer hardware & software) provided by suppliers not normally associated with the data processing business.

